The *Ringicula leptocheila* complex, with the description of a new species (Opisthobranchia; Ringiculidae)

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KEY WORDS: *Ringicula*, new species, taxonomy, lectotype, Mediterranean Sea, Recent, Pliocene.

ABSTRACT: The complex of species related to the taxon *Ringicula leptocheila* Brugnone, 1873, is revised in the Mediteranean Sea, with notes on some Atlantic species. *R. leptocheila* (lectotype herein selected) is an exclusively fossil (Pliocene) species. In the Mediterranean Sea two species are currently encountered often misidentified with it: *R. gianninii* Nordsieck, 1974 and *R. ciommeii* n. sp. The new species is characterised morphologically and morphometrically with respect to both *R. gianninii* and *R. leptocheila*. The type material of *R. nitida* Verrill, 1872 (lectotype herein selected), *R. peracuta* Watson, 1886 (lectotype herein selected) and *R. pirulina* Locard, 1897 (lectotype herein selected), has been examined and all along with *R. minutula* Locard, 1897, are regarded as valid and different taxa.

RIASSUNTO: **Il complesso di *Ringicula leptocheila*, con la descrizione di una nuova specie (Opisthobranchia; Ringiculidae).** Viene esaminato il complesso di specie mediterranee correlate con il taxon *Ringicula leptocheila* Brugnone, 1873, con note su alcune specie atlantiche. *R. leptocheila* (di cui viene selezionato il lectotipo) è una specie del Pliocene e l'uso di tale nome è ristretto al solo materiale fossile. Attualmente in Mediterraneo vengono rinvenute due specie recenti solitamente identificate sotto tale nome. L'analisi comparativa di abbondante materiale ha portato a definire l'esistenza di due specie correlate a *leptocheila* ma distinte: *R. gianninii* Nordsieck, 1974 e *R. ciommeii* n. sp. La nuova specie è caratterizzata morfologicamente e morfometricamente rispetto sia a *R. gianninii* sia a *R. leptocheila*. Delle varie specie frequentemente poste in sinonimia con *R. leptocheila* è stato esaminato il materiale tipico di *R. nitida* Verrill, 1872, *R. peracuta* Watson, 1886 (lectotipo qui designato) e *R. pirulina* Locard, 1897 (lectotipo qui designato), e tutte (oltre a *R. minutula* Locard, 1897) sono probabilmente da considerare specie distinte e valide.

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INTRODUCTION

In the Mediterranean Sea the genus *Ringicula* Deshayes, 1838, is traditionally represented by three species: *R. auriculata* (Ménard de la Graye, 1811), *R. conformis* Monterosato, 1877 and *R. leptocheila* Brugnone, 1873 (SABELLI *ET AL.*, 1990, 1992; BEDULLI *ET AL.*, 1995). These check-lists follow largely the opinions of CICCONE & SAVONA (1982) who most recently revised the genus in the Mediterranean Sea and proposed: i) *R. peracuta* Watson, 1886, and *R. gianninii* Nordsieck, 1974, as synonyms of *R. leptocheila*; ii) *R. nitida* Verrill, 1872, as a separate species from *R. leptocheila*, in spite of the fact that several authors in the past have synonymized them (DAUTZENBERG & FISCHER, 1896; DALL, 1889, BOUCHET, 1975); iii) *R. pirulina* Locard, 1897 as a synonym of *R. nitida*. But the complexity of this group is still far from being totally elucidated; in fact the Check List of European Marine Mollusca (CLEMAM: Gofas & Le Renard (eds), home page, http://www.mnhn.fr/base/malaco/html) shows a different taxonomic status for the NE Atlantic/Mediterranean species of this

Table 1. Shell features of 6 species of the *R. leptocheila*-complex plus *Ringicula* sp.

	R. leptocheila	*R. nitida*	*Ringicula sp.*	*R. peracuta*	*R. pirulina*	*R. gianninii*	*R. ciommei*
Shape	globose, moderately convex	globose, ovate, moderately convex	globose, convex	globose, cylindrical	globose, cylindrical, convex	globose, conical, moderately convex	globose, convex
Spire	conical elevated	scarcely elevated	conical, moderately elevated	narrowly conical	narrowly conical	narrowly conical	conical
Suture	well impressed	weakly impressed	weakly impressed	well impressed	well impressed	impressed	impressed
Teleoconch sculpture	about 20 spiral striae, equally spaced	14 spiral striae, equally spaced	about 6 spiral striae, distributed only in the lower part of the whorl	11 spiral striae, equally spaced	about 8 spiral striae, distributed only in the lower part of the whorl	about 18 spiral striae, equally spaced	about 28 spiral striae, equally spaced
Aperture	narrow, squared	large, rounded	large, rounded	narrow, squared	large, squared	narrow, rounded	large, squared
Peristome	thick, angled anteriorly	thick, rounded	moderately thick	thick, sinuose, slightly angled superiorly	not sharp, rounded	thick, rounded	not very thick, angled posteriorly
Columellar teeth	absent	absent	present	absent	absent	present	present
Columellar folds	two large, the lower larger	two large, equal size	two, equal size	two, equal size	two weak , equal size	two large, lower larger	two large, sometimes the lower larger

Table 2. Morphometrics of 6 species of the *R. leptocheila*-complex plus *Ringicula* sp. (USNM 107921, from off Fernandina, Florida). For *R. leptocheila, R. ciommeii* and *R. gianninii* the means (with standard deviations in parentheses) are given (individual measurements are available on request from the authors). Abbreviations: N = Sample size; H = Height (mm); W = Width (mm); Ha = Height of aperture (mm); Aa = Apical angle; Nd = Nuclear diameter (μm); Ss = no. of Spiral striae on the body whorl; Ct = Presence (+) or absence (-) of columellar teeth.

Species	N	H	W	H/W	Ha	H/Ha	Aa	Ss	Nd	Ct
R. leptocheila	30	4.5 (0.31)	3.2 (0.26)	1.38 (0.06)	2.9 (0.24)	1.55 (0.08)	68.4° (0.7°)	19.6 (0.6)	207.9 (2.4)	-
R. ciommeii	33	4.5 (0.43)	3.2 (0.27)	1.39 (0.07)	2.8 (0.23)	1.59 (0.06)	69.8° (0.6°)	28.4 (0.6)	179.5 (2.2)	+
R. gianninii	46	3.9 (0.38)	2.7 (0.23)	1.46 (0.06)	2.3 (0.20)	1.68 (0.06)	60.9° (0.5°)	18.4 (0.5)	154.5 (1.9)	+
R. nitida	1	4.5	3.5	1.29	3.04	1.47	80°	14	173	-
R. peracuta	1	4.4	2.9	1.51	2.56	1.70	57°	11	154	-
R. pirulina	1	5.9	3.8	1.56	3.64	1.62	60°	8*	154	-
Ringicula sp.	1	5	3.8	1.31	3.08	1.61	70°	6*	230	+

*Only in the lower part of the body whorl.

genus: i) *R. auriculata* is considered as a synonym of *R. conformis;* ii) *R. leptocheila* is synonymized with *R. nitida* (the latter having nomenclatural priority); iii) *R. peracuta* Watson, 1886, *R. pirulina*, *R. minutula* Locard, 1897 and *R. gianninii* Nordsieck, 1974 are also considered synonyms of *R. nitida*.

The record of many shells/specimens of a *Ringicula* of the *R. leptocheila*/*R. nitida* group that resulted hard to identify within either of the above taxonomic schemes, prompted us to attempt the revision of the group. We based the study on hundreds shells/specimens (including fossil shells), the original material of almost all the taxa involved in the proposed synonymies [*R. leptocheila* Brugnone, 1873, *R. nitida* Verrill, 1872, *R. peracuta* Watson, 1886, *R. pirulina* Locard, 1897], and a critical analysis of the original literature of *R. minutula* and *R. gianninii*.

The study focused on shell characters only, because live collected specimens are rare, and this hampered also definition of the habitat for nearly all the species studied. A morphological analysis of shell features (Fig. 2) resulted in the recognition of three entities within our Mediterranean fossil and Recent material (see the Remarks in the Systematics section for the detailed comparisons). In Table 1 a comparison of the morphological features of the species dealt with herein is summarised.

The fossil shells, for which only we adopt the name *Ringicula leptocheila* Brugnone, 1873, have a larger nuclear diameter and lack the columellar teeth which are, on the contrary, well defined in Recent shells. Among the Recent material, we have been able to distinguish two species based on the shell features. One is slender, with a smaller nucleus, and fewer spiral striae on body-whorl: there is an available name for it among the alleged synonyms of *leptocheila*, namely *R. gianninii* Nordsieck, 1974, whose original description and figure leave no doubt about the identification. The other species, with the shell outline closer (although not identical) to that of the fossil *leptocheila*, but with a nuclear diameter intermediate between *gianninii* and *leptocheila*, lacks a name and is here described as new.

We have analysed six morphometrics for the three species and their means (Table 2) resulted significantly different in an analysis of variance (see Table 3). We have also performed a multivariate Principal Component analysis on the morphometrics available for 109 shells (30 fossils and 89 Recent). In Fig. 1 the scores of the 109 shells are plotted on the 2nd and 3rd axis (the first one has been excluded given the bias it incorporated by the size-effect): the three groups identified by qualitative inspection of shell morphology have clearly different centroids and are scorable also in the plot.

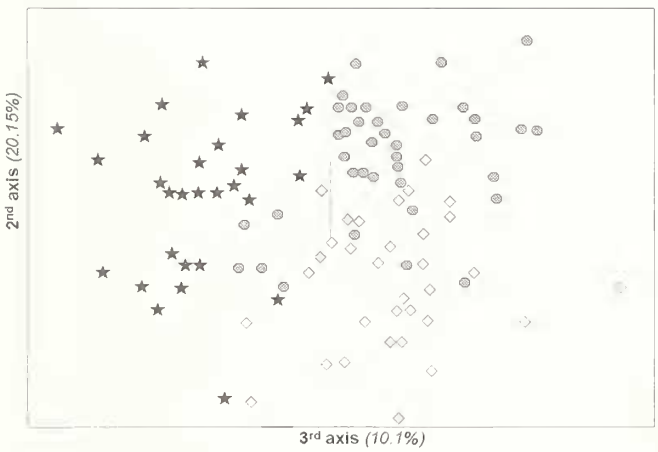


Figure 1 – Ordination pattern of 109 individual morphometrics on the 2nd and 3rd axis of a Principal Component Analysis. Stars = *R. leptocheila*; circles = *R. gianninii*; diamonds = *R. ciommei* n.sp.

Systematics

Family Ringiculidae Philippi,1853

Genus *Ringicula* Deshayes, 1838

Ringicula leptocheila Brugnone, 1873

(Figs. 3-6, 38-42)

Original description

(BRUGNONE, 1873: Miscellanea Malachologica, Pars I, p. 11, fig. 18)

Longitudo mill. 5, latitudo mill.4 - (Fossilis pleistocaena, et recens)

R. testa ovato-acuminata, ventrosa, tenuis, nitidula, subtilissime transversim striato-punctata: spira parum exerta: anfractibus 5, convexis: apertura magna, subangulata: columella contorta, plicata; plicis 1-2, acutis: labro tenuiter marginato, intus laevi: labio exilissimo, adnato.

Diagnosis

Shell of medium size for the genus (4.1-5.2 mm in length), globose. Spire conical. Whorls moderately convex, suture well impressed. Aperture narrow, squared, peristome thick, angled anteriorly. Columellar teeth absent, two large columellar folds, the lower larger. About 20 spiral striae on the teleoconch, equally spaced.

Type Material

The type material of *R. leptocheila* analyzed comprised the lectotype (MCZ), herein designated, 4.5 x 3.2 mm, and 204 paralectotypes (30 of them measured for statistical analysis) from Ficarazzi, Sicily (Italy), including original label in Brugnone's handwriting.

Type locality

Ficarazzi (Sicily), Italy, Pliocene.

Material examined

Only the type material.

Distribution

So far known with certainty only from the type locality. The records from other fossil deposits must be checked, because the actual number of fossil species (still not revised) in the complex is not known.

Remarks

Type material of *R. leptocheila* belonging to the Brugnone collection held in the Museo Civico di Zoologia di Roma, Italy, agrees well with the original figure (Fig. 3) and description by BRUGNONE (1873). We have designated a lectotype of *R. leptocheila* from the type material of the Brugnone collection. One point of discrepancy between the original description and the analysis of the type material is in the nature of the spiral furrows. Although Brugnone's description mentions "subtilissime transversim striato-punctata", we could not observe anything like that in all the shells examined. The spiral striae, even at high magnification, look like regular furrows, very similar to the ones of present in *R. gianninii* and the new species. In our opinion the possible "striato-punctata" look of these striae could be derived by the examination of some Recent shells, as stated by Brugnone himself "fossilis pleistocaena, et recens", which apparently show a reticulated sculpture, due to the crossing of spiral striae and growth lines, (see Figs. 27-28 and 29-31 for the Recent species). We do not know which Recent species was examined by Brugnone, but the fossil material clearly do not present this morphological feature. It is worth mentioning that this shell character was utilized by LOCARD (1897) to separate *R. leptocheila* from *R. nitida*, but without analyzing the type material of these taxa. In fact, Locard separated the two species on the ground of shell morphology comparison based only on the figures of *R. nitida* by Verrill and Pilsbry: "M. Pilsbry a cru devoir réunir cette espèce au *Ringicula nitida* de M. Verrill. Nous n'avons pu nous procurer le type américain de cette dernière espèce, mais si, comme nous avons tout lieu de le croire, les figurations qui en ont été données par MM. Verrill et Pilsbry sont exactes, nous constaterons sans peine que le *Ringicula leptochila* se sépare du *R. nitida*: par son galbe bien plus élancé, comme le montre du reste très bien la figuration de l'abbé Brugnone; par sa spire plus haute, plus acuminée; par son dernier tour également plus haut et bien moins ventru, par ses tours supérieurs plus développés, à profil moins convexe; par son ouverture bien moins arrondie, toujours beaucoup plus haute que large; par son bord externe bien plus haut et bien plus droit, par son test finement décoré de stries décurrentes transverses à la façon du *Scaphander punctostriatus*, etc." LOCARD (1897). The analysis of the type material has confirmed this point of view, in spite of the fact that *R. leptocheila* does not show any spiral furrows "à la façon du *Scaphander punctostriatus*".

Ringicula nitida Verrill, 1872

(Figs. 7-9)

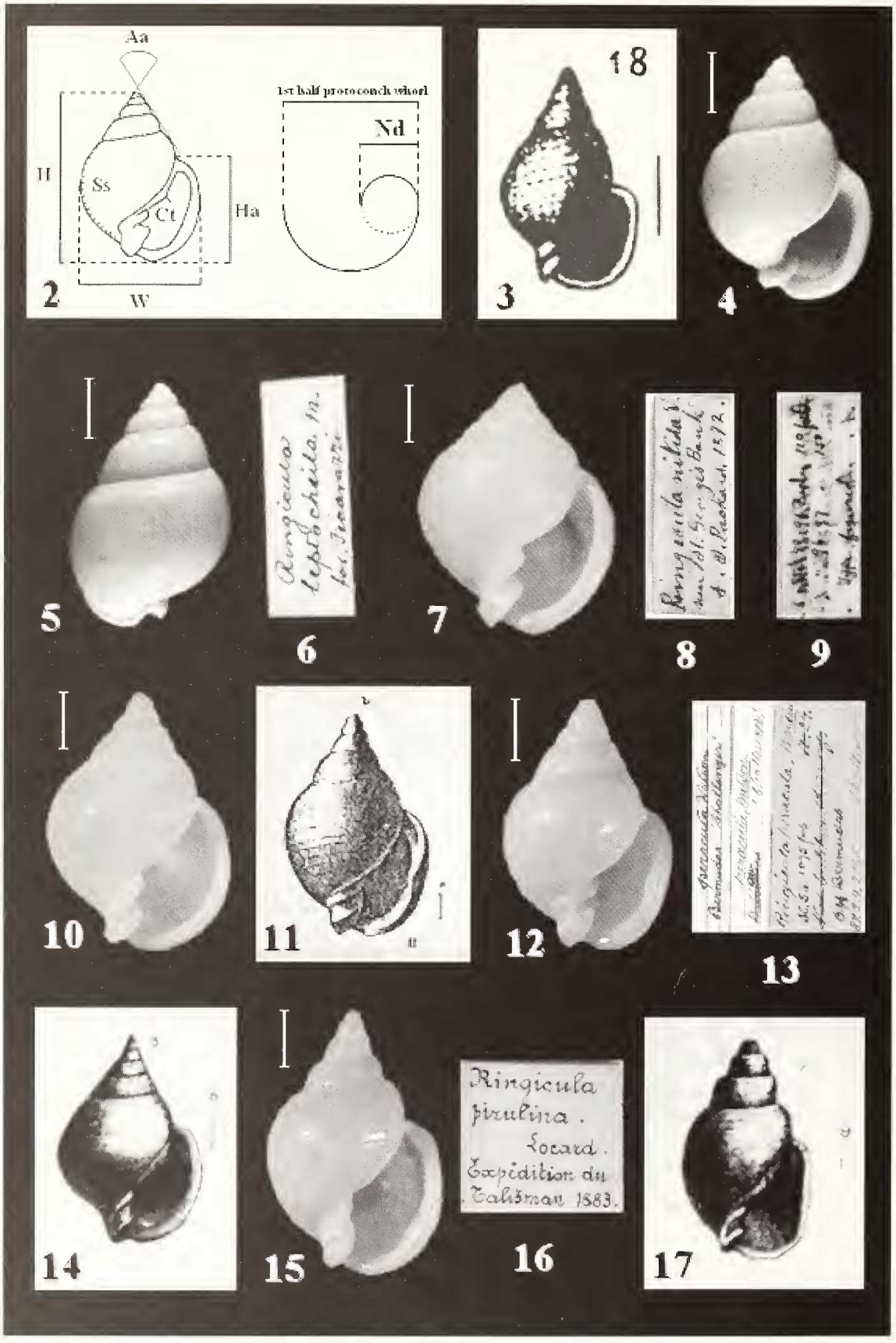
Original description

[(VERRILL, 1872 (1873): The American Journal of Science and Arts, New Haven, Third Series, 5 (25-30): not figured]

Shell small, white, smooth, broad oval, with five whorls, spire rapidly and regurarly tapered, sub-acute, shorter than the aperture. Whorls very convex, regurarly rounded, the sutures well impressed, a well marked. Impressed, revolving line just below

Table 3. Fischer test (alpha parameter 0.5): +/- indicate a significant/not-significant difference in the mean for this paiwise comparison. Abbreviations as in Table 2.

	R. gianninii						*R. cionmeii*						*R. leptocheila*					
	H	Aa	W	Ss	HA	ND	H	Aa	W	Ss	HA	ND	H	Aa	W	Ss	HA	ND
R. g.							+	+	+	+	+	+	+	+	+	–	+	+
R. c.	+	+	+	+	+	+							–	–	–	+	–	+
R. l.	+	+	+	–	+	+	–	–	–	+	–	+						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the suture; the surface otherwise nearly smooth, nut with more or less distinct, distant, microscopic revolving lines, most distinct anteriorly. Aperture somewhat crescent-shaped. Outer lip evenly rounded, forming the segment of a circle, the border regularly thickened, receding a little posteriorly, near the suture. Callus on the body whorl narrow, nearly even, but a little swollen in the middle and slightly raised. Columella stout, recurved at the end, with two strong, very prominent, equal, spiral folds, the anterior one projecting beyond the canal, with the end rounded. Length ·17 of an inch; breadth ·125; length of aperture ·10; breadth of same ·043.
Two living specimens from (o) 110 and (s) 150 fathoms, muddy bottom.

Diagnosis

Shell of medium size for the genus (4.5 mm in length), globose. Spire scarcely elevated, body-whorl ovate. Whorls moderately/neatly convex, suture weackly impressed. Aperture large, rounded, peristome thick, rounded. Columellar teeth absent, two large columellar folds of equal size. About 14 spiral striae on the teleoconch, equally spaced.

Type Material

At present, the type material of *R. nitida* is the lectotype (YPM 15776), 4.5 X 3.5 mm, collected by: A. S. Packard aboard U.S. Fish Commision Stmr. "Bache." Date: September 11, 1872. Atlantic Ocean, including original labels.

Type locality

The original description reports two stations Northeast of George's Bank for the two original shells, U.S.F.C. Stas. 89-91 (o) 110 fathoms, N 42°05', W 67°49'; stas. 96-97 (s) 150 fathoms, N 42°11', W 67°17'. Atlantic Ocean. We prefer to designate as type locality the entire area inclusive of the five stations.

Material examined

The type material and *Ringicula* sp., seven shells (USNM 107921), U.S.F.C. Sta 2668, 294 fms. Off Fernandina, Florida.

Distribution

The species is known with certainty only from the type locality.

Remarks

The year of issuing for *R. nitida* is indeed 1872 because separate copies of the work were distributed on December 13, 1872; while the whole volume V of The American Journal of Science and Arts was published from January to June 1873. When Verrill described this species, he was clearly referring to two shells, which indicates syntype status. JOHNSON (1989) was not able to locate the second shell at the National Museum of Natural History and therefore regarded as the holotype the remaining shell (YPM 15776); this is in fact, a lectotype designation according to ICZN Art. 72. According to DALL (1889), *R. nitida* would be a synonym of *R. leptocheila* and of *R. peracuta*: "I have satisfied myself by a comparison of authentic shells that the species of Verrill and Brugnone are the same, the former name having priority. The locality, description, and figure of *R. peracuta* agree well with some varieties of *R. nitida*, with which it does not seem to have been compared. The elevation and the extent of the spiral grooving differ in different individuals, as observed with species of *Actaeon*. Although fossil in the Italian Pliocene, this species has not yet been recorded from the so-called Pliocene of America." (DALL, 1889). As mentioned above, (Remarks of *R. leptocheila*), LOCARD (1897) on the contrary, commenting *R. leptocheila* had a different opinion. Later on, other authors have reconsidered *R. nitida* as a synonym of *R. leptocheila* (DAUTZENBERG & FISCHER, 1896; BOUCHET, 1975). In their revision CICCONE & SAVONA (1982) discussed shell morphological differences occurring between the two taxa, which are again separated as distinct species. In the CLEMAM, the group *R. leptocheila*, *R. peracuta*, *R. pirulina*, *R. minutula* and *R. gianninii* is synonymized with *R. nitida*. The analysis of the lectotype of *R. nitida* (Fig. 7) has revealed that this taxon is indeed different from *R. leptocheila* on the ground of shell morphology: *R. nitida* is more globose, possessing a smaller number of whorls (the last one is about 4/5 of the entire length), a nuclear diameter of about 170 µm, two equal columellar folds, aperture half-moon shaped and more regularly rounded, and fewer spiral striae (14). We also had the opportunity to examine seven shells of a *Ringicula* sp., labeled *R. nitida* (USNM 107921), which in fact resemble *R. nitida* (Fig. 10). The shell outline is anyway more elongated and less globose, the teleoconch is very light, almost transparent (the columella is visible through the whorls!), the few spiral striae (about 6) cover only half of the last whorl on the siphonal portion, a not-prominent columellar tooth is visible internally (shell feature present only in *R. gianninii* and the new speceis, see text below), the nuclear diameter is larger (about 230 µm).

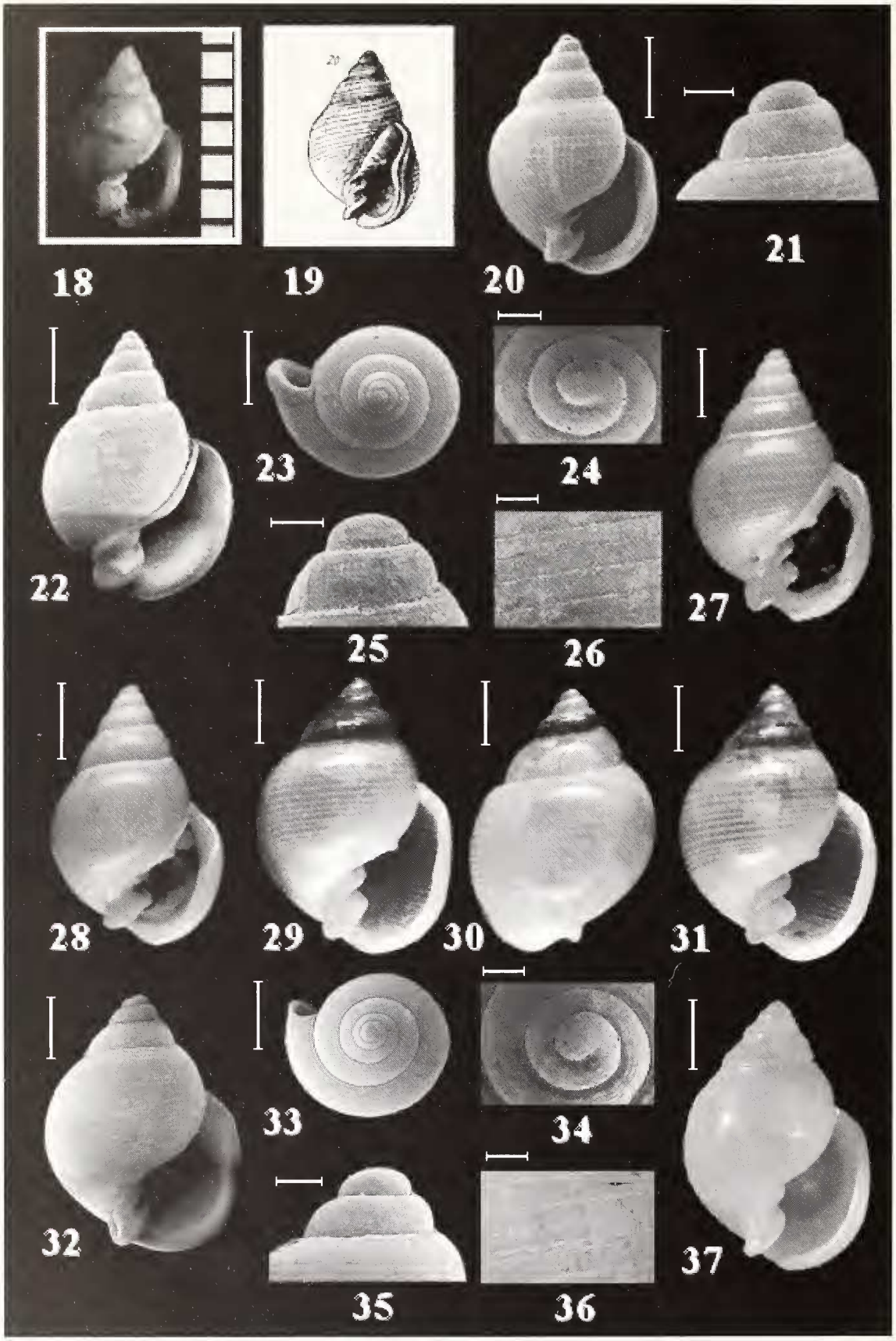
Ringicula peracuta Watson, 1886

(Figs. 11-13)

Original description

(WATSON, 1886: Scientific report of the voyage of H.M.S. Challenger during the years 1873-76, Report on the Scaphoda and Gastropoda XV, London, p.636, plate XLVII, fig. 11).
Shell. -Ovate, with a somewhat high conical small-pointed spire,

← **Figure 2** - Shell morphology of *Ringicula* spp.: H, Height; W, Width; Ha, Height aperture; Aa, Apical angle; Ss, Spiral striae; Nd, Nuclear diameter; Ct, Columellar teeth. **Figures 3-6** - *R. leptocheila*. 3. Type figure after Brugnone (1873). 4-5. Lectotype (MCZ). Ventral and dorsal views, 4.5 X 3.2 mm. Ficarazzi (Sicily), Italy, Pliocene. 6. Original label in Brugnone's handwriting. **Figure 7-9** - *R. nitida*. 7. Lectotype (YPM 15776). Ventral view, 4.5 X 3.5 mm. Atlantic Ocean. 8-9. Original labels. **Figure 10** - *Ringicula* sp. (USNM 107921). Ventral view, 5.0 X 3.8 mm. Off Fernandina, Florida. **Figures 11-13** - *R. peracuta*. 11. Type figure after Watson (1886). 12. Lectotype (NHM 1887.2.9.2145). Ventral view, 4.4 X 2.9 mm. Off Bermudas. 13. Original label. **Figures 14-16** - *R. pirulina*. 14. Type figure after Locard (1886). 15. Lectotype (MNHM). Ventral view, 5.9 X 3.8 mm. West Morocco. 16. Original label. **Figure 17** - *R. minutula*. Type figure after Locard (1886). Scale bar 1 mm (Figs 4-5, 7, 10, 12, 15).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smooth and glossy. spirally furrowed below the periphery, with a marginated suture and a largish mouth. *Sculpture:* Longitudinals-the whole surface is pretty regularly scored with distinct, but not sharp, shallow furrows on the lines of growth. Spirals-just below the suture is a fine furrow fictitiously strengthened by the shining through of the superior whorl; from the periphery to the point of the base there are rather remote spiral furrows, which seem to vary as usual in number and in distinctness. *Colour* glossy white, with a faint bluish tinge. *Spire* rather high, conical, scarcely subscalar. *Apex* sharp; for though the extreme tip is a little tumid, it stands well up and is rounded. *Whorls* 5, conical, slightly convex; the last is little tumid above, but a little way behind the outher lip it becomes contracted and flattened. *Suture* distinct. *Mouth* rather large, not very oblique. *Outer lip* very oblique to the axis of the shell, slightly thickened, toothed and prominent in the middle, with large open sinus above, and a very slight one in front. *Inner lip:* there is a rather slight callus with a small tooth about the middle, the pillar-teeth, which are very far from parallel, are nearly equal. H. 0.18 in. B. 0.1. Mouth, height 0.1, breadth 0.07.

Diagnosis

Shell of medium size for the genus (4.4 mm in length), globose-cylindrical. Spire narrowly conical. Whorls moderately convex, suture impressed. Aperture narrow, squared, peristome thick, sinuose, sligthly angled anteriorly. Columellar teeth absent, two columellar folds of equal size. About 11 spiral striae on the teleoconch, equally spaced.

Type Material

The type material of *R. peracuta* is the lectotype (NHM 1887.2.9.2145), herein designated, 4.4 X 2.9 mm, Station 56: Lat. 32° 8' 45" N, long. 64° 59' 35" W, off Bermudas, 1075 fathoms; five paralectotypes (NHM 1887.2.9.2142-4) Station 24: 18°38'30" N, 65°5'30" W, North of Culebra Island, West Indies, 390 fathoms; one paralectotype (NHM 1887.2.9.2146), Station 122: 9°5' N, 34°50' W, off Pernambuco, 350 fathoms. Including original labels.

Type locality

Station 56: Lat. 32° 8' 45" N, long. 64° 59' 35" W, off Bermudas, 1075 fathoms.

Material examined

Only the type material.

Distribution

Caribbean area.

Remarks

In Fig. 11 is given the type figure of *R. peracuta* after WATSON (1886). As already mentioned above, this species has been considered in the past by some Authors as a synonym of *R. nitida* (DALL, 1889; CICCONE & SAVONA, 1982, CLEMAM). The analysis of the types of *R. peracuta* (Fig. 12) has revealed that this taxon is easy distinguishable from both *R. leptocheila* and *R. nitida*. In fact, *R. peracuta* has a different shell shape, slender, showing less convex whorls, with the outer lip bearing a diagnostic V-shaped callus located in the middle, which confers to the aperture a narrower and sigmoid shape. Furthermore, it has a sligthly smaller nuclear diameter (about 154 µm).

Ringicula pirulina Locard, 1897

(Figs 14-16)

Original description

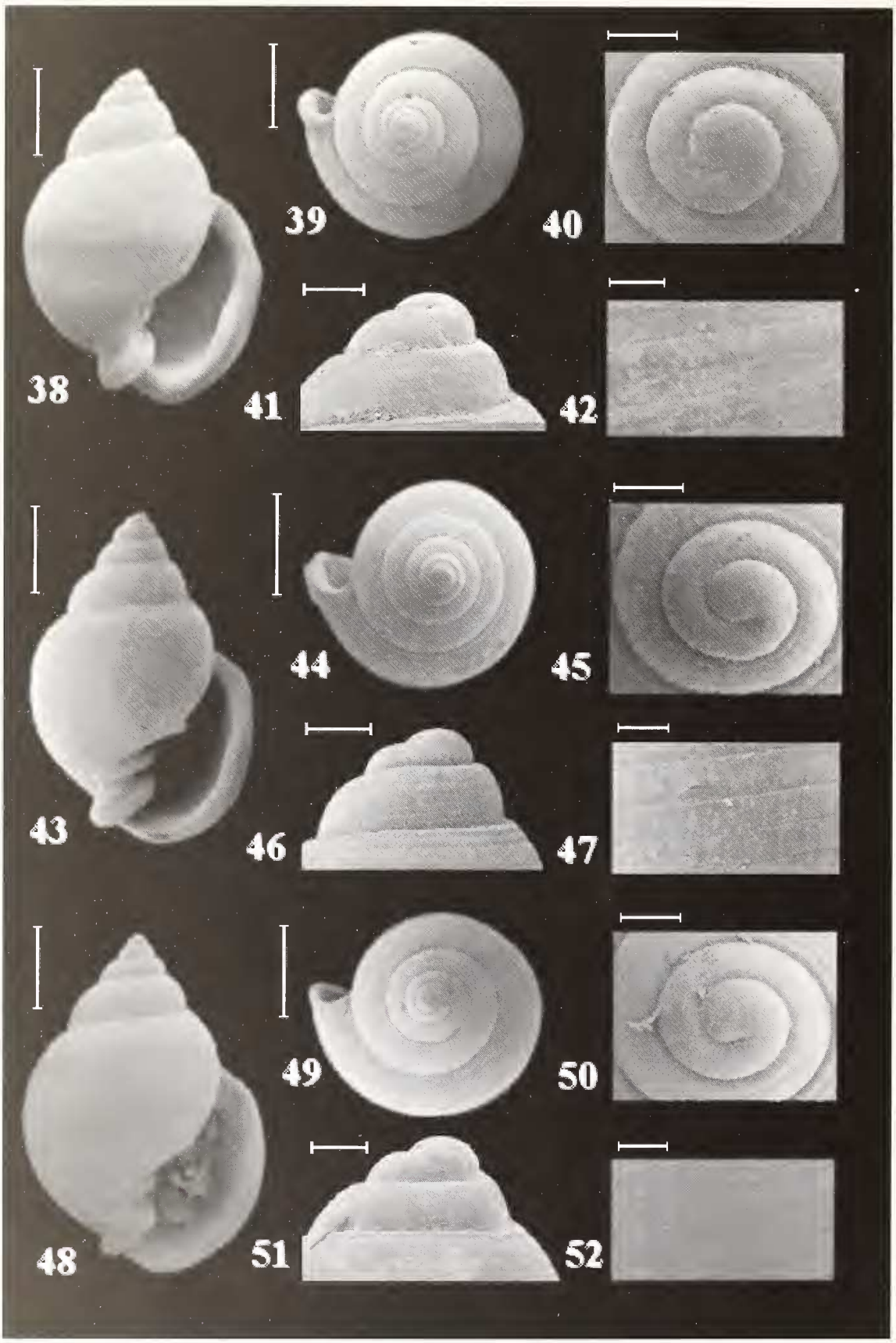
(LOCARD, 1897: Expéditions scientifiques du Travailleur et du Talisman pendant les années 1880, 1881, 1882, 1883, Mollusques testacés, Paris, p.87-88, planche XIV, figs 1-6).

Coquille de petite taille, d'un galbe piriforme bien ventru, arrondi dans le bas, fortement acuminé dans le haut. Spire relativement très haute, à profil latéral nettement concave, composée de cinq à six tours très faiblement convexes, peu distincts, non étagés, à croissance régulière et progressive, dernier tour égal en hauter aux trois quarts de la hauteur totale, trés gros, bien arrondi, piluliforme, faiblement atténué dans le bas, terminé par un canal court, droit, étroit, bien ouvert. Suture linéaire peu sensible. Sommet trés petit, légèrement mamelonné. Ouverture sensiblement égale à la demi-hauteur totale, sub-semilunaire, peu large, mais notablement plus rétrécie en haut qu'en bas. Péristome à bords subcontinus; bord externe évasé et renversé surtoute sa périphérie, à profil latéral bien arrondi, le tout inscrit dans un plan vertical; bord columellaire arrondi dans le haut, court et droit dans le bas, muni dans le haut d'un épais callum portant dans le milieu une petite saillie dentiforme très obtuse, accompagné dans le bas de deux plis, le pli basal épais, très tordu et remontant, le pli supérieur moins fort et plus oblique-ascendant. Test solide, épais, subopaque, d'un blanc très brillant, un peu jaunacé, orné de stries décurrentes très effacées, régulières, bien espacées, dont une ou deux à peine un peu plus accusées vers le haut. Dimensions - Hauteur totale 7 millimètres. Diamètre maximum 5 millimètres.

Diagnosis

Shell of moderately large size for the genus (5.9 mm in length), globose-cylindrical. Spire narrow. Whorls neatly convex, suture well impressed. Aperture large, squared, peristome not very

← **Figures 18-28** - *R. gianninii*. **18, 19.** Type figures after Nordsieck (1974). **20, 21.** Off Latium coast [Fiumicino (RM)], Central TyrrhenianSea, Italy. **22-27.** Off Latium coast [Tor Vajanica (RM)], Central Tyrrhenian Sea, Italy (26 details of the sculpture). **28.** Montecristo Island (Tuscan Archipelago), Northern Tyrrhenian Sea, Italy. **Figures 29-37** - *R. ciommeii*. **29, 30.** Holotype (MZB), off Latium coast (41°51'N 11°28'E), Central Tyrrhenian Sea, Italy. **31.** Paratype A (MZB), off Latium coast (41°51'N 11°28'E), Central Tyrrhenian Sea, Italy. **32-36.** Off Tuscany coast, unrecorded depth, Northern Tyrrhenian Sea, Italy (36 details of the sculpture). **37.** Off Pantelleria Island, (36°501'N 12°003'E), Strait of Sicily, *R/V "Urania"*, Sta. CS 96 #119, 331 m depth. Scale bars: 1 mm (Figs. 20, 22, 23, 27-33, 37); 200 µm (Figs. 21, 24-26, 34-36).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sharp, rounded. Columellar teeth absent, two weack columellar folds of equal size. About 8 spiral striae on the teleoconch, only on the lower part of the whorl.

Type Material

The type material of *R. pirulina* is the lectotype (MNHN), herein designated, 5.9 X 3.8 mm and one paralectotype (MNHN), Talisman, 1883, Dragage 33, West Morocco, including original label.

Type locality

Station: Talisman, 1883. Dragage 33. - Profondeur 1,350 m. A l'Ouest du Maroc.

Material examined

Only the type material.

Distribution

So far known only from West Morocco.

Remarks

In Fig. 14 one of the type figures of *R. pirulina* is illustrated after LOCARD (1897), who has separated this taxon from *R. peracuta*: "Le *Ringicula peracuta* du Rév. Boog Watson seul a quelque analogie avec notre coquille; mais cette dernière a un galbe encore plus globuleux, une spire plus acuminèe et différemment profilée, des tours moins distincts, moins étagés. moins convexes, une ouverture moins étroite, des plis columellaires moins parallèles, etc." We agree in considering this species separable from *R. peracuta* and in a more general view, from the whole *R. leptocheila/nitida* group. According to the original description and the various original figures published by LOCARD (1897), this species, which is rather larger (up to 7 mm in height!) than the other claimed synonyms of *R. leptocheila* (see text above), is clearly distinguishable from these. Furthermore, we analyzed the types that confirm that this is indeed a valid taxon, different from all the other species previously discussed. In fact, *R. pirulina* has a peculiar shell shape, upper whorls very slender and turriculated, with the last whorl globose and about 3/4 of the entire length, in spite of its big size the shell is light, few spiral striae (8 in the lectotype) covering only half of the last whorl on the siphonal portion.

Ringicula minutula Locard, 1897

(Fig. 17)

Original description

(LOCARD, 1897: Expéditions scientifiques du Travailleur et du Talisman pendant les années 1880, 1881, 1882, 1883, Mollusques testacés, Paris, p.89-90, planche XV, figs 7-9).

Coquille de très petite taille, d'un galbe ovoide-ventru, un peu allongé, un peu plus développé et acuminé en dessus qu'en dessous. Spire peu haute, composée de cinq tours très étagés, à profil arrondi dans le haut, droit latéralment, à croissance un peu rapide; dernier tour un peu plus petit que les deux tiers de la hauteur totale, un peu ventru dans la partie médiane, à profil latéral, du coté opposè au bord externe, un peu étroitement convexe, lentement et progessivement attènué dans le bas: Suture linéaire,marginée, très accusée. Sommet très petit, obtus, un peu mamelonné. Ouverture plus petite que la demi-hauteur totale, étroitement piriforme, rétrécie dans le haut, arrondie dans le bas, presque droite. Péristome à bords subcontinus; bord externe simple, épaissi, mais non réfléchi, très étroitement arrondi en haut, presque droit latéralement, bien arrondi dans le bas; bord columellaire un peu arqué dans la partie supérieure, droit et court à la base, accompagné dans le haut d'épais callum, portant dans sa partie médiane une saillie subtuberculeuse peu haute, large et très sensible, et dans le bas deux plis, le plus inférieur fortement tordu, le second rapproché, moins fort et plus ascendant. Test solide, épais, subopaque, d'unblanc grisâtre un peu terne, orné de nombreuses stries décurrentes, régulières, continues, assez rapprochées, recouvrant tout le test, mais devenant un peu plus fortes à la base. Coloration d'un blanc grisâtre. Dimensions - Hauteur totale 2 1/2 millimètres. Diamètre maximum 1 millimètres.

Diagnosis

Shell of small size for the genus (2.5 mm in length), rather cylindrical. Spire narrow. Whorls convex, suture apparently well impressed. Aperture large, squared, peristome sharp, angled anteriorly. Columellar teeth absent, two columellar folds of equal size. Spiral striae on the teleoconch.

Type locality

Station: Talisman, 1883. Dragage 84. - Profondeur 860 m. Tropiques.

Material examined

We have not examined the type material nor any sample referable to this taxon, but only the original figure and description.

Remarks

In Fig. 17 is illustrated one of the original figures of *R. minutula* after LOCARD (1897). The single type shell is probably a juvenile. After the drawing, the outline is somewhat similar to *R. pirulina* but without examining the specimen we cannot take a final decision. Certainly, it is quite different from the juveniles of all other species dealt with herein and particularly of the two Mediterranean species.

Ringicula gianninii Nordsieck, 1974

(Figs 18-28,43-47)

← **Figures 38-42** - *R. leptocheila*. Paralectotype B (MCZ), Ficarazzi, Sicily (Italy), Pliocene (42 details of the sculpture). **Figures 43-47** - *R. gianninii*. Off Latium coast [Tor Vajanica (RM)], Central Tyrrhenian Sea, Italy (47 details of the sculpture). **Figures 48-52** - *R. ciommeii*. Paratype O, off Latium coast (41°51'N 11°28'E), Central Tyrrhenian Sea, Italy, (52 details of the sculpture). Scale bars 1 µm (Figs. 38-39, 43-44, 48-49); 200 µm (Figs. 40-42, 45-47, 50-52).

Original description

(NORDSIECK, 1974: La Conchiglia, Roma, VI (61): p. 13, figs 19-20)

"Ringicula (Ringicula) **gianninii** n. sp.5,2/3,4 mm. Monotipo nella coll. Giannini presenta tutti caratteri del sottogenere di MONTEROSATO *ringiculina*. La bocca inizia un pò sopra la metà dell'altezza della conchiglia, ma distante dalla sutura dell'ultimo giro. Il labbro forma un ampio seno, poi è compresso, a metà circa della bocca. il canale è molto corto e stretto. La callosità parietale non è molto estesa. presenta un bordo e una forte denticolazione a metà altezza circa. Differisce da *leptocheila* BRUGNONE, 1873 (tipo del genere) per i seguenti caratteri: 1. La conchiglia è molto più slanciata. 2. I trattini spirali sono più fitti e non punteggiati, tagliati da linee di accrescimento distanziate. 3. La columella è più lunga e le due pliche sono ineguali, quella inferiore è più forte e più dritta verso l'alto. Giri armonicamente arrotondati, labbro moderatamente varicoso, non ripiegato, parete semitrasparente."

Diagnosis

Shell of medium size for the genus (3.2-4.1 mm in length), globose. Spire narrowly conical. Whorls convex, suture impressed. Aperture narrow, rounded, peristome thick, rounded. Columellar teeth present, two large columellar folds, the lower larger. About 18 spiral striae on the teleoconch, equally spaced.

Type Material

The Giannini collection has recently been sold and we have been so far unable to trace the holotype.

Type locality

Bocche di Bonifacio, stazione K1, Capo Comino, 200/220 m.

Material examined

Thirty shells from the Central Tyrrhenian Sea, offshore coast of Tor Vajanica (RM), Latium, 180 m depth; 6 shells from the Central Tyrrhenian Sea, offshore coast of Fiumicino (RM), Latium, 200 m depth; 11 shells from the Northen Tyrrhenian Sea, off Montecristo Island, Tuscany Archipelago, 200 m depth; 5 shells from the Strait of Sicily, R.V. "Urania", Stn #288-CS 96, 300 m depth; 2 shells (MNHN) from NW "Canyon de la Cassidagne" (1 juvenile: 43°06.6'N – 005°27.5'E 200-300 m depth, H. Zibrowius leg.; 1 fragm.: 43°06.7'N – 005°33.0'E 150-250 m depth, H. Zibrowius leg.); 6 shells (MNHN) from "Golfe de Gascogne", R/V "Thalassa" research campaign (1 shell stn. W441 44°10'N – 007°41'W 440-445 m depth; 3 shells stn. Z420 48°20'N – 009°38'W 507 m depth; 1 shell stn. Z437 48°35'N – 010°24'W 610 m depth; 1 fragm. stn. DS 52 44°06'N – 004°22'W 2006 m depth); 1 shell (MNHN) from West Galice, R/V "Thalassa" research campaign (T482 44°02'N – 008°44'W 489-492 m depth); 1 fragm (MNHN) from "Banc Le Danois", R/V "Thalassa" research campaign (stn. X345 44°06'N – 004°41'W 525-550 m depth).

Distribution

Tyrrhenian Sea and Strait of Sicily within the Mediterranean basin. Atlantic Ocean.

Remarks

In Figs. 18-19 the original figures of *R. gianninii* are reported after NORDSIECK (1974). This is the last taxon synonymized with the *R. leptocheila/nitida* group according to several authors (CICCONE & SAVONA, 1982; SABELLI *ET AL.*, 1990, 1992; BEDULLI *ET AL.*, 1995, CLEMAM). As previously mentioned (see Remarks on *R. leptocheila*), this taxon is clearly distinguishable from the fossil *R. leptocheila* and we agree with the original description given by Nordsieck, who specified the shell differences occurring between the two taxa. Furthermore, *R. gianninii* is also different from all Recent supposed synonymes discussed in this work; the shell outline of *R. gianninii* (Figs. 27-28) resembles the one of *R. peracuta* (Fig. 12), but it has a clear inner lip teeth, larger columellar folds, a bigger aperture and a more open siphonal canal. We consider *R. gianninii* a valid taxon.

Ringicula ciommeii n. sp.

(Figs 29-37, 48-52)

Description

Shell small, light, globose-ovate, upper part slender and conical, suture well-defined. Shells range from 4.0 to 4.9 mm in length, the holotype measures 4.9 mm in length and 3.2 mm in width. Protoconch of 1 1/2 whorls, smooth, without microsculpture even at high magnification. Teleconch of 4-4 1/2 whorls, bearing from 24 to 34 spiral furrowss well-marked and equally spaced, crossing very fine growth striae irregularly distributed. Aperture about 2/3 of the total height, half-moon shaped, with two evident columellar plicae at the base of the columellar callus. On the inner lip of the aperture, at about 2/3 of its length, a tiny tooth protrudes from the thin columellar callus only in the adult shells. Peristome slightly thickened and bent toward the internal side. In fresh shells, through the aperture, the spiral furrows are visible in the internal surface of the last whorl by transparency. Siphonal canal very short, no umbilicus. The color is uniformly milky-white. Shell translucent and shiny, semitransparent in fresh shells, turning to glossy milky-white in dead shells.

Diagnosis

Shell of medium size for the genus (4.0-4.9 mm in length), globose. Spire conical. Whorls convex, suture impressed. Aperture large, squared, peristome usually not very thick, angled anteriorly. Columellar teeth present, two large columellar folds, sometimes the lower larger. About 28 spiral striae on the teleoconch, equally spaced.

Type Material

The type material of *R. ciommeii* consists in the following shells. The holotype, 4.9 X 3.2 mm, with dried soft parts, and the paratypes A, 4.4 X 3.0 mm; B, 4.6 X 3.4 mm; C, 4.2 X 3.1 mm; D, 3.3 X 2.4 mm; E, 4.5 X 3.1 mm; F, 4.0 X 2.7 mm; G, 4.2 X 3.0 mm; H, 4.1 X 2.9 mm; I, 4.0 X 2.8 mm; J, 4.3 X 3.1 mm; K, 4.8 X 3.3 mm; L, 4.2 X 2.9 mm; M, 4.3 X 3.1 mm; N, 4.2 X 2.9 mm; O, 4.6 X 3.4 mm, from the Central

Tyrrhenian Sea (coast of Latium, 41°51'N, 11°28'E, 360-600 m depth). The holotype and paratypes A-C are deposited in the malacological collection of the Museo di Zoologia dell'Università di Bologna (MZB), Italy, with the numbers MZB 11298, 11290-11292, respectively. The paratypes D-H are in the private collection of Francesco Giusti, Livorno, Italy. The paratypes I-O are in the Author's collection, Roma, Italy.

Type locality

Central Tyrrhenian Sea off coast of Latium (41°51'N 11°28°E; 360-600 m).

Material examined

Other material examined of *R. ciommeii*: about 300 shells (15 of them measured, together with the type material, for statistical analysis) from the Central Tyrrhenian Sea (off Latium coast, 41°51'N, 011°28'E, 41°24'N, 012°03'E, 360-600 m depth), 3 shells from the Northern Tyrrhenian Sea (off Tuscany coast, 400-600 m depth); 2 shells from the Strait of Sicily, off Pantelleria Island, 36°51'N 012°03'E, bioclastic sands, R/V "Urania", Sta. CS96#119, 331 m depth.

Habitat

Muddy-bathyal bottoms surrounding deep-sea coral banks.

Distribution

Tyrrhenian Sea, Strait of Sicily and Spanish Mediterranean coast (El Garraf, Barcelona).

Etymolgy

This species is named in memory of Cesare Ciommei, expert malacologist, with whom we have had much pleasure searching Mediterranean shells.

Remarks

R. ciommeii is conchologically clearly distinguishable from all other Mediterranean Ringiculidae and in particular from the fossil *R. leptocheila* and the Recent *R. gianninii*, as summarized in Tables I and II and as previously discussed (see *R. leptocheila* and *R. gianninii* Remarks). For an easier comparison of shell characters of these three taxa see Figs. 38-52.

According to the large number of shells/specimens of the two Recent Mediterranean species we have examined from various sites, the specific shell features outlined in this work seem to be very constant and we could not observe any intermediate forms between *R. ciommeii* and *R. gianninii*. Also the iconography found in the literature examined so far, corroborates the assumption that the conchological characters of the two species are constant, regardless of the collecting area.

R. ciommeii in the Northern and Central Tyrrhenian Sea belong to the faunal assemblages of the muddy-bathyal bottoms surrounding deep-sea coral banks, from 360 to 600 m depth. A young shell of *R. ciommeii* (2.37 mm in length) has been reported by Giribet & Peñas (1997) from the Garraf coast, as *R.* cfr. *leptocheila* (p. 55, 77; figs 78, 81, and not 79). Also for this record the collecting site ("El Parrusset", NE Iberian Peninsula) is located in a submarine canyon, at a depth of 200-450 m, hosting white coral banks.

The scattered distribution so far outlined for *R. ciommeii* is likely to change and the gaps in the range to be filled with the characterization of other Mediterranean deep-water assemblages, and after re-checking of private and musem collections of the *R. leptocheila*-group.

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